MODEL 60A PROGRAMMER
Operator's Guide

DATA I/O

Operator's Guide

MODEL 60
LOGIC PROGRAMMER

980-0122-001 (ref. 990-0018-001) DEC 85
Copyright © Data I/O Corporation, 1984. All rights reserved.

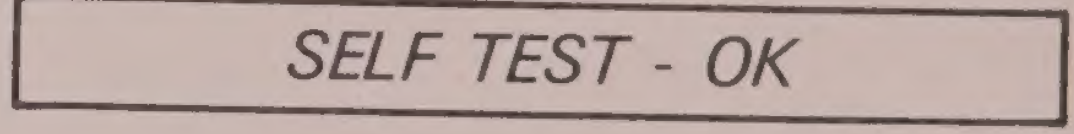
GETTING STARTED

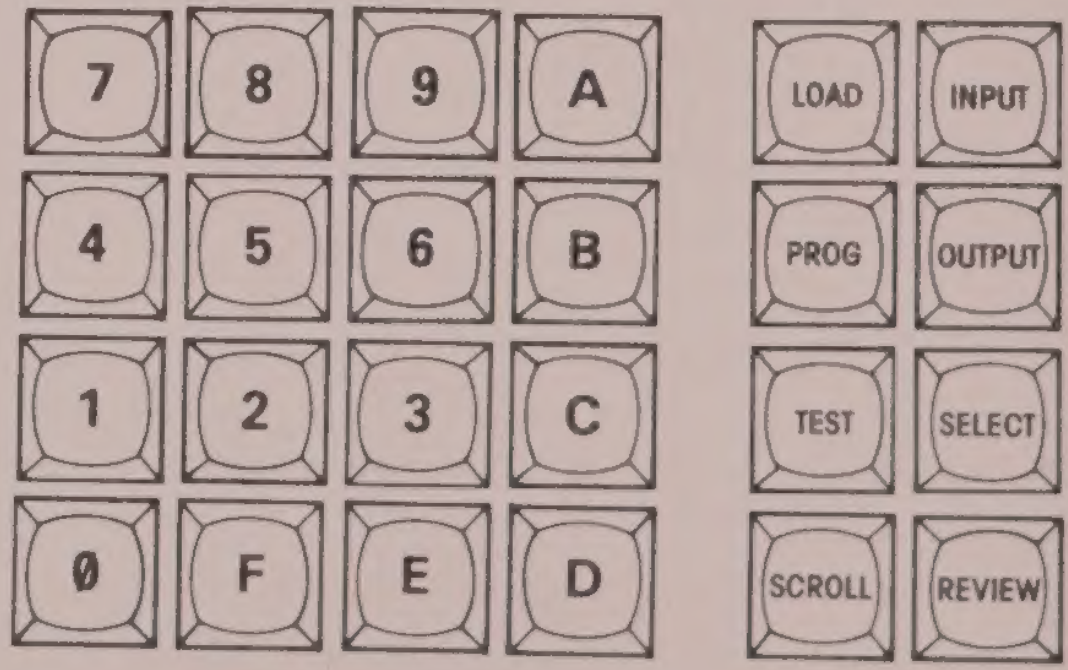
The Data I/O Model 60 is a versatile programmer used to program such devices as integrated fuse logic, programmable array logic, and field programmable logic array devices. The Model 60's keyboard and setup procedures are discussed in this section. Subsequent sections in the Operator's Guide present programming, use of system commands, and communications operations and procedures.

THE KEYBOARD

The keyboard features color-coded keys; the blue keys are used to perform specific programming functions, while the gray keys are used to select input/output operations, to setup commands, to scroll from one display (programmer function) to the next or previous display.

DISPLAY:
Displays the current status of the programmer.





HEX KEYBOARD:
Allows entry of hexadecimal values.

START KEY:
Used to initiate the function selected on any of the other keys.

LOAD KEY: Used to download fuse map data from a master (already programmed) device to the programmer's memory.

PROG KEY: Used to program and selectively test a device installed in the socket adapter.

TEST KEY: Used to initiate selective testing of a previously programmed device installed in the socket adapter.

INPUT KEY: Used to receive JEDEC format data via the serial I/O port to the programmer's memory.

OUTPUT KEY: Used to transmit JEDEC format data via the serial I/O port from the programmer's memory.

SELECT KEY: Used in conjunction with the entry of a two-character command code to select any of the programmer functions described in the System Commands section.

SCROLL KEY: Used to advance the prompt or message on the programmer display.

REVIEW KEY: Used to scroll backwards to the previous message on the display, or to clear a numeric entry.

START KEY: Used to initiate the function selected on any of the other keys.

GENERAL OPERATING NOTES

When operating the Model 60, keep the following items in mind:

- When applying power to the Model 60 - Check to make sure the sockets are empty. If a device is in either socket, lift the socket lever and lift the device out of the socket.
- Entry Prompt - Whenever an entry or selection is required by the operation via the front panel of the programmer, a flashing cursor (∧) appears on the display.
- Entry Correction - When a mistake is made while making an entry on the programmer's hexadecimal keyboard, correction may be made by pressing the REVIEW key and starting the entry over again.
- Aborting an Operation - Most operations (except for a few select functions) can be aborted by pressing one of the three blue mode keys (LOAD, PROG, or TEST). If an operation is in progress when one of these keys is pressed, the Model 60 momentarily displays the message:

FUNCTION ABORT

then assumes the mode selected and displays the message appropriate for that mode.

- Action Symbol - Load, program, and test operations are indicated to be in progress by a rotating action symbol (⊡).
- I/O Operation - When executing input-output related operations, be sure the correct operational parameters such as baud rate, parity, stop bits, etc. are set to the required values.
- Select Codes - All display messages that signify a selectable function contain a two-character hexadecimal select code. This code may be entered after pressing the SELECT key to display the associated programmer function instead of scrolling through other display messages.

ERROR MESSAGES

- Some programmer operations or protocols attempted may result in the programmer halting operation and an error message being displayed. For a full explanation of error messages, consult the operation and maintenance manual, appendix A.

PART NUMBERS AND FAMILY/PINOUT CODES

All devices that can be programmed by the Model 60 are identified by the manufacturer and the manufacturer's part number, or by a two-digit device family code in conjunction with a two-digit pinout code. The family/pinout code is usually a direct correlation to the part number, and like the part number may be used to uniquely identify an appropriate algorithm for each programmable device.

CAUTION

Be sure you enter the correct part number, or family and pinout code, for the device to be inserted in the programmer. An incorrect selection can cause unpredictable results at the device socket, which may damage the device. Data I/O assumes no responsibility or liability for results produced by incorrect entries.

SELECTION PROCEDURE

Select a particular device (for loading, programming, or testing) on the Model 60 as follows (the procedure assumes the LOAD key is used, but applies for the PROG and TEST keys also - with the display reading PROG or TEST as applicable):

1. Select the load function.

where MFG is the manufacturer's code, and PPPPP is the device part number.

MMI = Monlithic Memories	SIG = Signetics
NSC = National Semiconductor	TI = Texas Instruments
AMD = Advanced Micro Devices	HAR = Harris Semiconductor

If the displayed manufacturer and part number is the same as that of the device to be programmed, proceed to step 4.

If it is necessary to select a different manufacturer and/or part number, proceed to step 2.

If it is desired to select a device by means of the family and pinout codes, proceed to step 3.

NOTE: If an invalid part number, family code, or pinout code entry is made, the Model 60 responds with an audible beep, prompting for the correct entry.

2. To select a new device manufacturer and/or part number.

SCROLL → *SELECT DEVICE*

START → *DEV = ∧ MMI 12L10*

prompting for the selection of a manufacturer.

To select a different manufacturer, perform step 2a.

To retain the displayed manufacturer, but select a different part number, perform step 2b.

2a. Select a different manufacturer.

SCROLL or REVIEW

as necessary to display the desired manufacturer.

DEV = ∧ MFG PPPPP

with the desired manufacturer displayed

2b. Select a different part number.

START

DEV = MFG∧ PPPPP

where PPPPP is the lowest part number for the displayed manufacturer.

Display the desired part number of the selected manufacturer.

SCROLL and/or REVIEW or N

where N is the second digit of the part number. (Entry of the second digit of the part number reduces the amount of SCROLL and REVIEW key action that may be required to display the desired part number.

3. To select a device by means of the family and pinout code.

where NN is the two-character family code, and △ prompts for entry of the pinout code.

where NN is the two-character pinout code.

4. With the particular device selected on the Model 60, proceed to the Programming or Testing sections to continue operation.

DEVICE PROGRAMMING

The following sequence of commands loads the fuse map from a programmed logic device into the programmer's memory, performs selected checks on the new device, programs the new device, and verifies the data in the newly programmed device. Individual functions and components of the displays are explained following the command sequence.

When programming a device, it is possible to:

- select any or all of several test functions
  (illegal bit check) (structured vector test)
  (non-blank check) (logic fingerprint test)
  (fuse map/array test)
- blow or not blow the security fuse
- select the reject option

Use the following procedures to (1) load program data from a master or previously-programmed device to the programmer, and (2) then program a new logic device with the loaded fuse data.

The final state of the display after a key sequence is executed is shown following that sequence. For some operations, the programmer display may indicate intermediate steps. In particular, the display indicates any testing operations as they take place during the programming operation.

LOADING DATA FROM THE MASTER DEVICE

1. Select the particular device to be loaded as described in the Device Selection.

2. Install the master device in the socket adjacent to the lighted LED. At this point you can:

   (a) load the program data from the device into the programmer (see step 3), or

   (b) select the number of logic fingerprint cycles prior to loading the data into the programmer (see step 5).

   (c) select the starting vector (if to be other than 00000000 hex) for the logic fingerprint learn or test operation (see step 6).

   (d) examine the logic fingerprint™ learned by the programmer during a previous load operation (see step 7).

3. To load the program data (fuse map) into the programmer's memory

START → *LOAD ARRAY MFG* ↵

then

LEARN FPRINT ↵ (if enabled)

then

LOAD DONE XXXX

where XXXX is the checksum of the logic device fuse map.

4. Remove the master device from the socket adapter and install the device to be programmed in its place.

   You are now ready to program the new device(s).

5. Select the number of logic fingerprint cycles.

SCROLL until *FPRINT CYCLES E8*

START *FPRINT CYCLES∧00*

N N *FPRINT CYCLES∧NN*

where NN is the number of cycles be in the range of 01 through 99 (decimal) to perform the fingerprint test; an entry of 00 (default value) disables the logic fingerprint function of the programmer.

START *LOAD MFG PPPPP*

6. Select the starting vector.

SCROLL until *FPRINT VECTOR E9*

START *START 00000000*

N N N N N N N N

START NNNNNNNN

where NNNNNNNN is the hexadecimal representation of the starting vector for the logic fingerprint test.

START *LOAD MFG FXX PYY*

7. Examine the learned logic fingerprint.

SCROLL until *FPRINT VECTOR E9*

START *START ∧ NNNNNNN* (the starting vector)

START *FPRINT ∧ XXXXXXX*

where XXXXXXX is the learned logic fingerprint for the installed logic device.

PROGRAMMING THE DEVICE

Use the following procedure to program a device with program data previously loaded into the programmer.

1. Select the programming mode

   If you are programming a device immediately following the load operation of a master device, then MFG PPPPP will be that required for the programming operation. In this case proceed to step 2.

   If it is necessary to select a different manufacturer and/or part number, select the particular device to be programmed as described in the Device Selection.

2. With the device to be programmed installed in the socket above the lighted LED,

   (a) program the device using the data stored in the programmer memory (see step 3), or

   (b) use the SCROLL key to select any of the test functions described in the System Commands section, then program the device.

3. Initiate the programming operation.

START → *ILLEGAL BIT CK* (if enabled)

NOTE: During the programming operation, the display indicates the current operational status of the programmer, which varies depending on the testing parameters selected. Refer to Test Modes Selection (E6) in the System Commands section for details regarding test selection.

the programmer then displays

PROG ARRAY MFG ☐

TEST ARRAY MFG (if the fuse verify test is enabled)

APPLY VECTORS (if the vector test is enabled)

TEST FRPINT ☐ (if logic fingerprint test is enabled)

PROG DONE XXXX

indicating that programming of the device is complete and where XXXX is the checksum of the logic device fuse map.

To program another device in an identical manner, remove the programmed device from the socket adapter, install a new device, then

START

DEVICE TESTING

During device programming operations with the Model 60, any or all of several tests can be performed at the option of the operator. The Model 60 also provides a means of performing these same tests without the programming operation.

When testing a device, it is possible to perform any or all of the following tests on a previously programmed device:

- Fuse map/array test
- Structured vector test
- Logic fingerprint test

Perform testing of a programmed device as follows:

1. Select the particular device to be tested as described in the Device Selection.
2. Install the master device in the socket adjacent to the lighted LED. At this point you can:

   (a) test the device in accordance with previously selected test parameters (see step 3), or

   (b) select from the available tests (array test, logic fingerprint test, and vector test)

3. Initiate the test(s).

START

NOTE: During the testing operation, the display indicates the current operational status of the programmer, which varies depending on the testing parameters selected.

TEST ARRAY MFG (if the fuse verify test is enabled)

APPLY VECTORS ◻ (if the vector test is enabled)

TEST FPRINT ◻ (if the logic fingerprint test is enabled)

TEST DONE XXXX

indicating that programming of the device is complete and where XXXX is the checksum of the logic device fuse map.

If the device fails to pass any of the selected tests, the programmer displays one of the following messages:

VERIFY FAIL 1 23

VERIFY FAIL 2 24

FNGRPRINT FAIL 74

VECTOR FAIL 75

4. If it is desired to test another device in an identical manner, remove the tested device from the socket adapter, install the next device to be tested, then

START

SYSTEM COMMANDS

The Model 60 offers numerous system commands that allow the selection of operating modes, communications protocol, testing options, fuse map editing, etc. System commands are identified by means of two-character hexadecimal codes which are entered at the front panel keyboard.

The following table lists each of the system commands with the corresponding two-character codes, and the initial factory-set default value (where applicable) for the command. The pages that follow describe the most frequently used of these commands, except for those related to communications. Refer to the Communications section for descriptions of the communications-related commands.

MODEL 60 SYSTEM COMMANDS

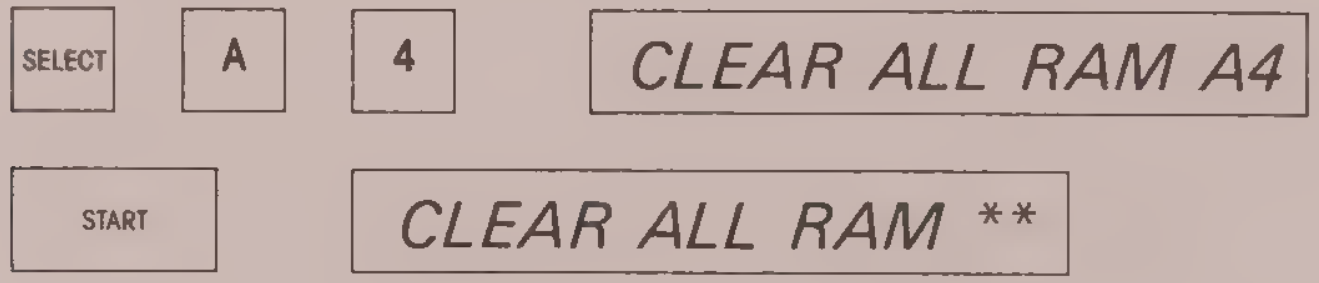
Command Name	Command Code	Default Value
Baud Rate	DA	9600
Calibration Mode	C1	N/A
Clear RAM	A4	N/A
Computer Remote Mode	F1	Off
Display Sumcheck	ED	N/A
Display System Configuration	B2	N/A
Echo/No Echo	C0	Echo
Edit Fuse Map	EE	N/A
End of Data Code	C6	CTL Z
Fill Fuse Map	A2	Zero
Fingerprint Cycles	E8	Zero
Fingerprint Vector (enter/display)	E9	All Zeros
Illegal Bit Check	CC	Illegal Bit CK On
JEDEC Mode	C2	JEDEC Full
List Vectors	CE	List Vectors Off
Non-Blank Check	B4	Non-Blank CK On
Output Fuse Map	EA	N/A
Over/Under Blow	C8	Off
Parity	DB	None
Power-Down Save	FE	N/A
Reject Options	E5	Reject Option 0

MODEL 60 SYSTEM COMMANDS (Continued)

Command Name	Command Code	Default Value
Remote On/Off Code	FC	Disabled
Security Fuse	E7	Disabled/Fuse = 0
Set Fuse Format	C4	X/-
Stop Bits	DC	One
Terminal Mode	E1	Off
Test Modes	E6	Perform All Tests
Verify Passes	CA	Verify Passes = 2

CLEARING THE PROGRAMMER MEMORY (A4)

The Model 60 provides a means of clearing the portion of the programmer memory (RAM) that contains fuse map data, test vectors, and other JEDEC data uses in the programming of devices. It may be useful to use this feature to clear the memory when test vectors and logic fingerprint setup information needs to removed from the programmer's memory.



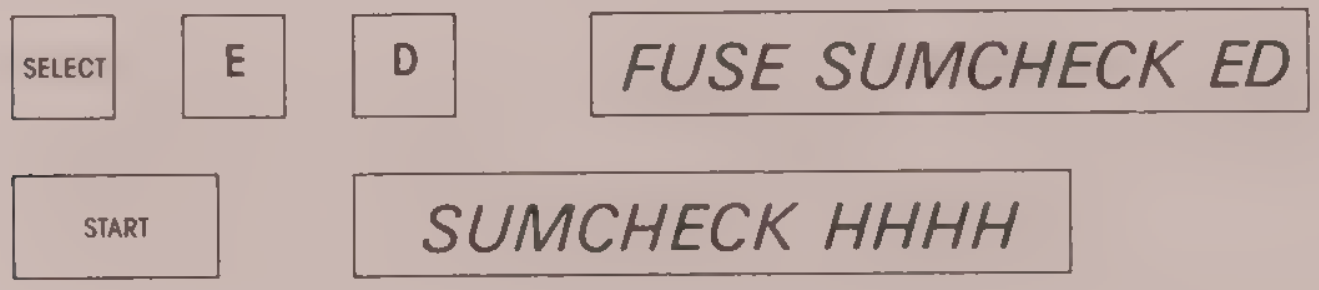
COMPUTER REMOTE CONTROL MODE (F1)

The Model 60 may be operated by means of the front panel, or by a remote computer as described in the Operation and Maintenance Manual. Selection of the remote control mode is made by means of the programmer front panel.

DISPLAYING A FUSE MAP SUMCHECK (ED)

A programmed logic device can be identified by its sumckeck, a 16-bit (4-hex character) wide data word created from the summation of the bits in the fuse map. The sumcheck may be used to simply identify a programmed part, or to verify its contents during troubleshooting.

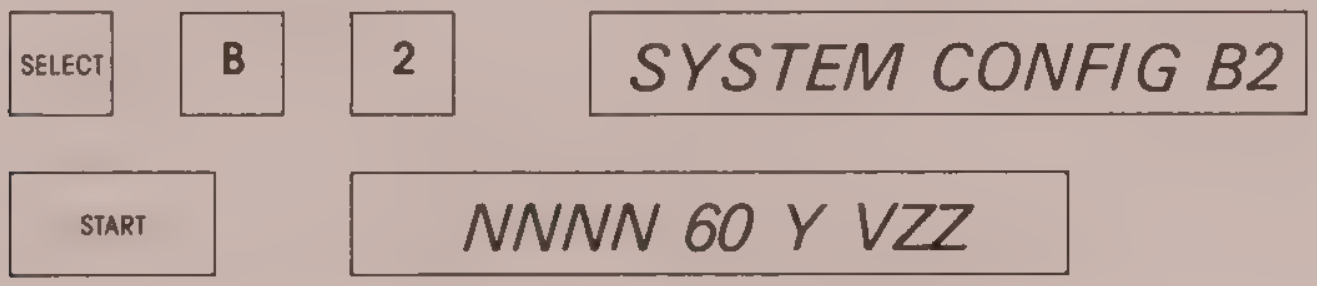
Before the sumcheck of a device can be displayed on the programmer, the device must be installed in the socket adapter and the fuse map loaded into the programmer's memory (or loaded by means of an input communications operation.



where HHHH is the sumcheck of the fuse map stored in the programmer's memory.

DISPLAYING PROGRAMMER CONFIGURATION (B2)

The Model 60 is shipped with several variable features, such as model number and version of software. To determine the configuration of your Model 60 programmer, perform the following key sequence.



where NNNN is the checksum of the PROMs containing the control software for the programmer, 60Y is the model designation of the unit, and VZZ is the version of operating software currently installed.

EDITING THE FUSE MAP (EE)

The Model 60 allows editing of the fuse map stored in the programmer memory, either loaded from a master device, downloaded from a remote data source, or created from a Fill Fuse Map (A2) operation. The individual fuses that make up the fuse map may be changed from blown to unblown, or vice versa, when contained in the programmer memory. Using the programmer, even with a terminal, provides a limited amount of editing capability. For extensive amounts of fuse map editing, the use of a sophisticated development system such as ABEL™ is recommended.

SELECT E E → *EDIT FUSE MAP EE*

START → *EDIT FUSE^ 0000*

prompting for the entry of the fuse number to be examined and/or altered.

Enter the number of the fuse; up to four digits (no leading 0's required).

N N N N → *EDIT FUSE^ NNNN*

where NNNN is the number of the fuse to be examined and/or altered.

START → *FUSE NNNN DX∧ RX*

where NNNN is the fuse number, DX is the state of the fuse in the device placed in the socket, and RX is state of the fuse in the programmer memory.

Enter the desired state of the fuse into the programmer memory, where N is either a 1 (fuse intact) or 0 (fuse blown).

N START → *FUSE NNNN+1DX∧ RX*

incrementing the fuse number

REVIEW → *FUSE NNNN-1 DX∧ RX*

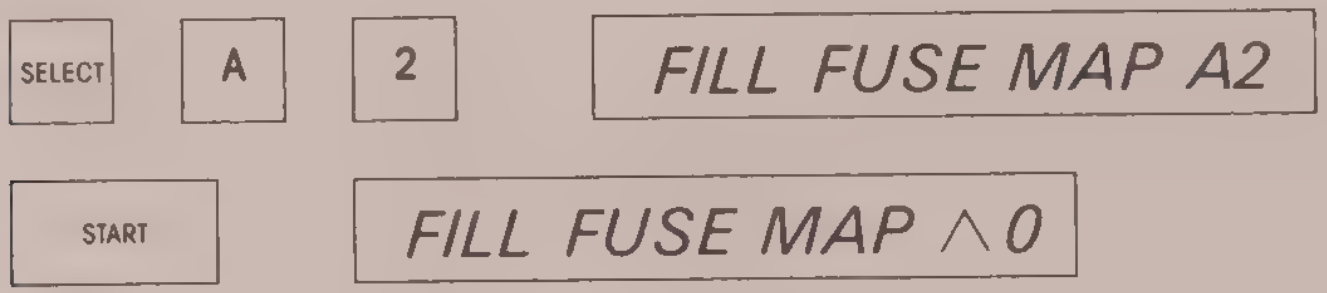
decrementing the fuse number

To return to the prompt for the entry of a new fuse number as described in step 2,

SCROLL → *EDIT FUSE ∧0000*

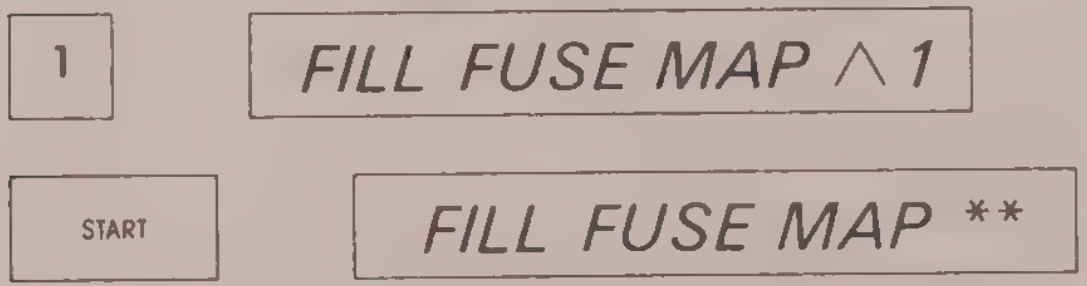
FILLING THE FUSE MAP (A2)

The Model 60 provides a means of setting the fuse map portion of its memory to all logic 1's or all logic 0's. This feature affects only the portion of the memory assigned for fuse map data, and may be useful when using the programmer to create a fuse map.



To fill with all 0's

To fill with all 1's



FINGERPRINT CYCLES ENTRY (E8)

The Logic Fingerprint is a signature analysis based method developed by Data I/O for testing programmable logic devices, where the number of test cycles directly affects the test result (fingerprint).

NOTE: A selection of zero fingerprint cycles disables the logic fingerprint test.

SELECT E 8 → *FPRINT CYCLES E8*

START → *FPRINT CYCLES ∧00*

The △ prompt indicates that a two-digit number in the range of 01 through 99 can be entered at this point.

N N → *FPRINT CYCLES NN*

where NN is the desired number of cycles

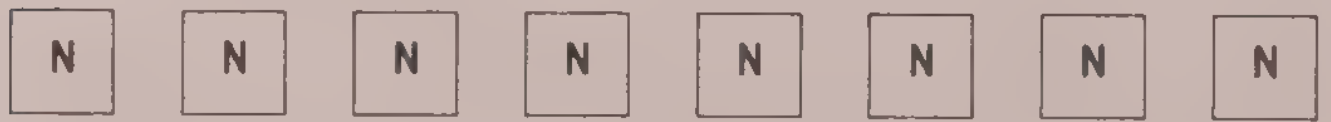
NOTE: If a mistake is made when entering the numeric value, press the REVIEW key and repeat the entry.

START → *FPRINT CYCLES ***

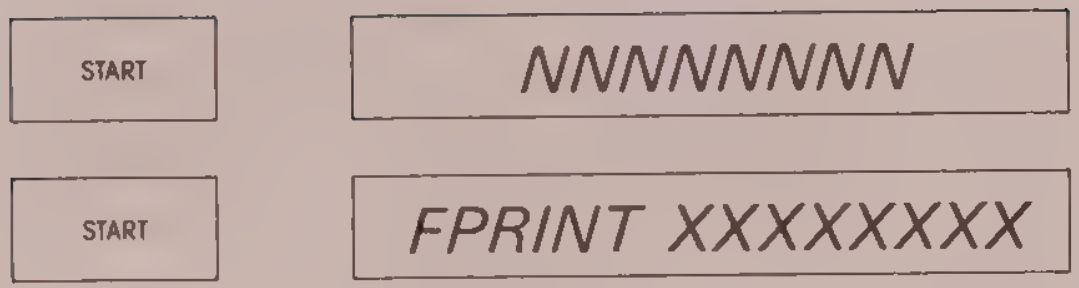
FINGERPRINT STARTING VECTOR ENTRY (E9)

The Logic Fingerprint test requires the entry of a starting vector if the default value of 00000000 is not to be used. If a starting vector of 00000000 is to be used, it is not necessary to perform this command unless the vector was previously altered and requires alteration back to 00000000.

The △ prompts for the 8-character hexadecimal starting vector to be entered via the keyboard.



to enter the desired starting vector, using trailing zeroes as necessary to correctly position the vector in the 32-bit word.



where XXXXXXXX represents the Logic Fingerprint as calculated by the programmer during the load operation for the device installed in the socket adapter.

NOTE: It is possible at this point to enter a logic fingerprint value into the programmer (instead of obtaining the fingerprint) by executing a Load operation of a master device. This feature may be used when the master device is unavailable, but the logic fingerprint for a given number of cycles and starting vector are known.

LOGIC FINGERPRINT DISPLAY (E9)

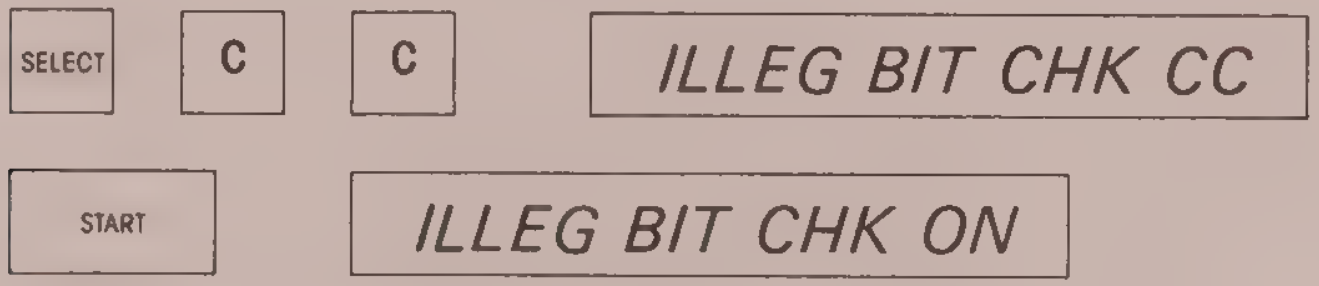
During a load operation, where greater than zero fingerprint cycles are selected, the programmer "learns" the logic fingerprint for a certain device. To display this fingerpint on the front panel display or remote terminal, proceed as follows:

where 00000000 is the starting vector for the logic fingerprint test

where HHHHHHHH is the logic fingerprint of the device loaded into the programmer.

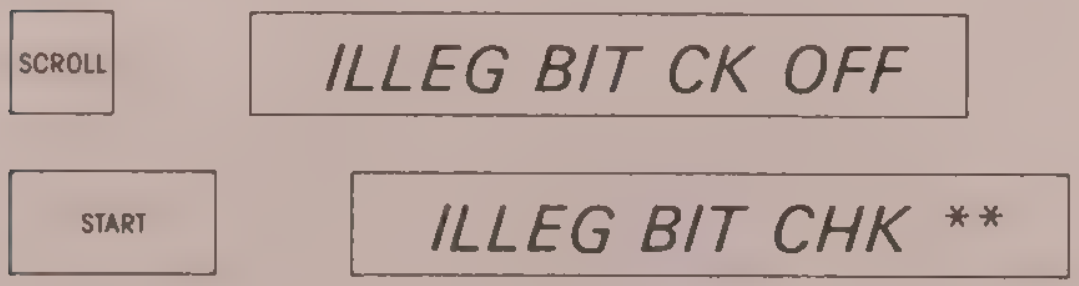
ILLEGAL BIT CHECK (CC)

As part of the programming operation, the Model 60 can be made to check each fuse in each device against the fuse map stored in memory prior to the actual programming of the device. This check ensures that no fuses are already blown in the device that will not be blown during actual programming of the device. This test insures that only suitable devices will be programmed.



If it is desired to select the illegal bit test,

otherwise



LISTING FAILED TEST VECTORS (CE)

This feature may be used during test operations to create a printed record of (or to display on a remote terminal) device failures, using previously generated test vectors. (Test vectors are generated by means of the logic development tool used to design the logic device, or by means of the Model 60 and a remote terminal; see the Operation and Maintenance Manual.)

This system command, in connection with a serial printer or remote terminal connected to the communications port on the back panel, causes the programmer to generate a record of device failures by printing and/or displaying up to 50 failed test vectors.

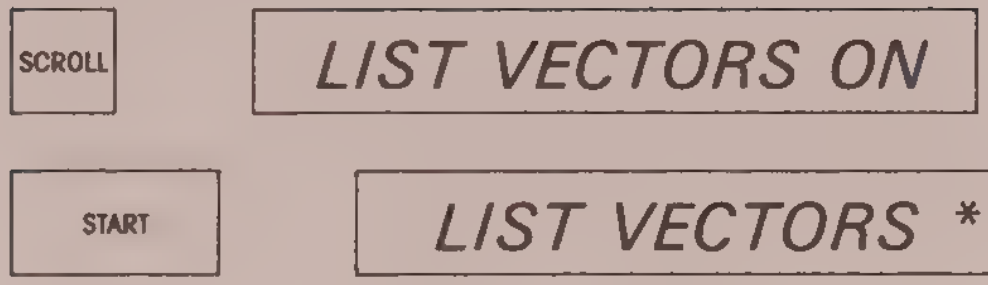
SELECT C E *LIST VECTORS CE*

START *LIST VECTORS OFF*

if listing of failed vectors is not desired

START *LIST VECTORS ***

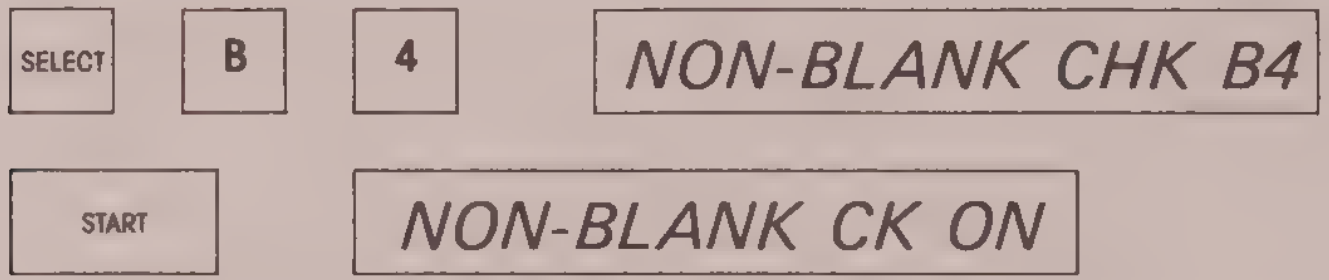
otherwise



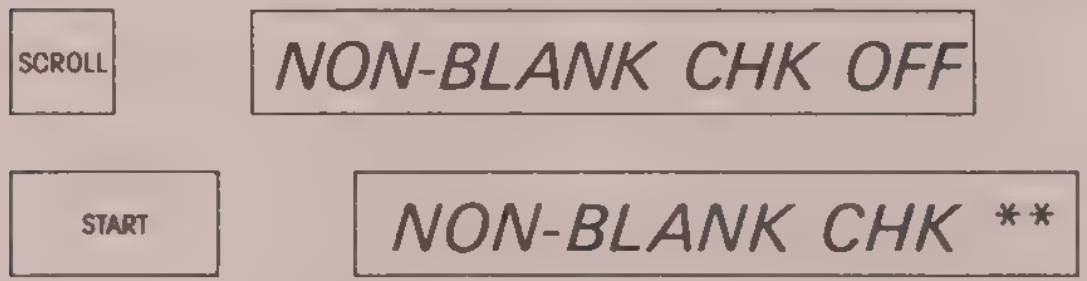
NOTE: To display or print the failed test vectors on a printer and/or terminal, perform a vector test on the device. Upon completion of the test, the failed vectors will be listed on the printer and/or displayed on the terminal.

NON-BLANK CHECK (B4)

As part of the programming operation, the Model 60 can be made to check each device to ensure that no fuses are blown before actual programming of the fuses begins. This test insures that only blank devices will be programmed.

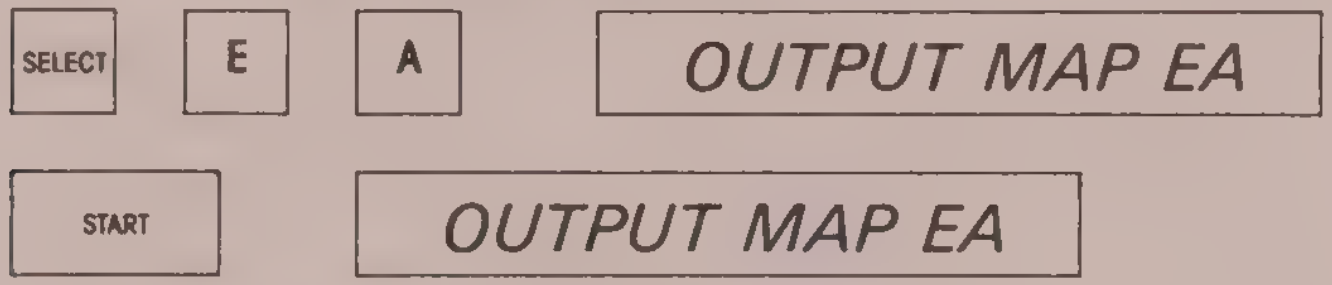


To perform the non-blank check of each device prior to programming,



OUTPUT THE FUSE MAP (EA)

This command transmits the fuse pattern contained in the programmer memory to the serial port. With a terminal connected to the serial port, the fuse pattern can be displayed as shown in the illusration. The fuse pattern is represented by a series of "1"s and "0"s, or a series of "-"s and "X", depending upon the selection made by means of the C4 and C8 commands. The "1" or "-" character represents a high resistance or blown fuse in a fuse link device, while the "0" or "X" represents a low resistance or intact fuse. Each fuse can be identified by its fuse number (decimal).



```
Command :  A - Disolay fuse patterri

      00           10           20
0000  -------X--   ----------   ----
0024  XXXXXXXXXX   XXXXXXXXXX   XXXX
0048  XXXXXXXXXX   XXXXXXXXXX   XXXX
0072  XXXXXXXXXX   XXXXXXXXXX   XXXX
0096  X-X-------   ----------   ----
0120  XXXXXXXXXX   XXXXXXXXXX   XXXX
0144  ----X-----   ----------   ----
0168  --------X-   ----------   ----
0192  ----------   -X-X------   ----
0216  XXXXXXXXXX   XXXXXXXXXX   XXXX
0240  ----------   ----X--X--   ----
0264  ----------   -----XX---   ----
0288  ----------   ----------   -X--
0312  ----------   ----------   ---X
0336  ----------   ----------X   ----
0360  XXXXXXXXXX   XXXXXXXXXX   XXXX
Sumcheck 1BB3

Command :
```

NOTE: - = open
X = intact

Fuse Number = First Fuse Number + Increment

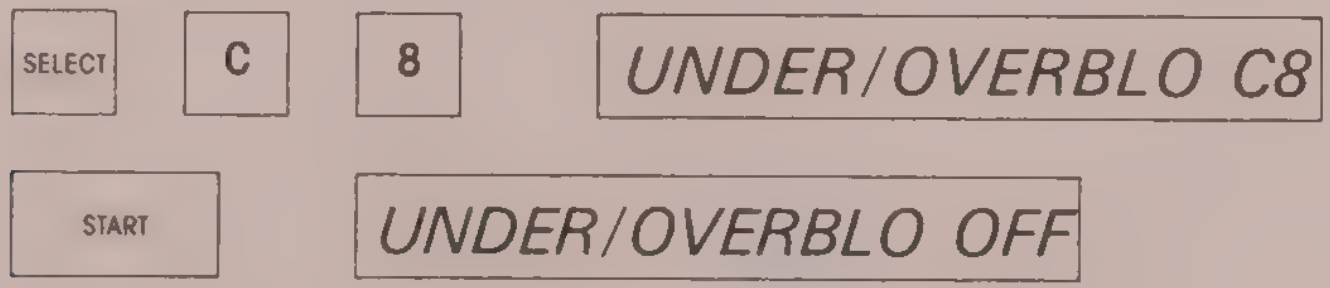
TYPICAL FUSE PATTERN DISPLAY

UNDER/OVERBLOW FUNCTION (C8)

This command allows the selection of an overblow/underblow check to be performed by the programmer. This check, performed during an Output Fuse Map operation, compares the fuse map of the device installed in the socket adapter and the fuse map stored in memory for any underblow or overblow conditions. The result of the comparison is presented on the terminal connected to the serial port.

An underblow condition occurs when the programmer memory indicates that a particular fuse should be blown and the device in the socket has that fuse intact. An overblow condition occurs when the programmer memory indicates that a particular fuse should be intact, yet the part has that fuse blown. The underblown condition of a fuse is indicated on the terminal display by a "U," as shown in the illustration, while the overblown condition is indicated by a "B."

NOTE: To display under/overblow conditions, the Output Fuse Map operation must be performed with the under/overblow function enabled.



If it is not desired to indicate underblow or overblow conditions on the fuse map sent to and displayed on the terminal

START → *UNDER/OVRBLO* **

otherwise, select the over/underblow function

SCROLL → *UNDER/OVRBLO ON*

START → *UNDER/OVRBLO* **

```
      00              10              20
0000  BBBBBBBBBB      BBBBBBBBBB      BBBB
0024  BBBBBBBB-B      -B-B-B-B-B      -B-B
0048  -B-B-B-B-B      -B-B-B----      ----
0072  ----------      ----------      ---B
0096  B-B----B--      --B--B-B-B      --B-
0120  B---B---BB      BBBBBBBBBB      BBBB
0144  BBBBBBBBBB      BBBBBBBBBB      BBBB
0168  BBBBBBBBBB      BBBBBBBBBB      BBBB
0192  UXUUUUUXXU      XUXUXUUUUU      UXXX
0216  UUXXUUUUUX      XXXUUXUXUX      UUUX
0240  BBBBBBBBBB      BBBBBBBBBB      BBBB
0264  BBBBBBBBBB      BBXBXBBBBB      BBBB
0288  BBBBBBBBBB      BBBBBBBBBB      BBBB
0312  BXBXBXXBBB      BXBXBBBXBB      BBBB
0336  XXXXXXXXXX      XXXXXXXXBB      BBXX
0360  XXXXXXXXXX      XXXXXXXXBB      BBXX
0384  BBBBBBBBBB      BBBBBBBBBB      BBBB
0408  XBBXBXXBBB      BXBXBBBXBB      BBBB
0432  XXXXXXXXXX      XXXXXXXXXX      XXXX
0456  XXXXXXXXXX      XXXXXXXXXX      XXXX
SUMCHECK 0A6B
```

FUSE PATTERN DISPLAY WITH UNDER/OVERBLOW FUNCTION ENABLED

POWER DOWN SAVE FEATURE (FE)

The Model 60 contains a power down save feature that allows saving commonly set system parameters values in a non-volatile memory for future use. The accompanying table lists the parameters which can be saved upon power down of the programmer. Initially, a default value is in effect for each of the parameters.

POWER DOWN SAVE PARAMETERS AND INITIAL DEFAULT VALUES

Select Code	Select Function	Initial Default Value
DA	Baud rate	9600
DB	Parity	None
DC	Number of stop bits	One
C2	JEDEC mode	Full
C6	End data code	CTL Z
CA	Number of verify passes	2
E5	Reject count	0
E6	Test options	All tests
none	Manufacturer & part no.	n/a
none	Family/pinout codes	n/a
F1	Computer remote mode at power-up	Off
B4	Non-blank test on/off	On
FC	Remote on/off codes	Disabled
C8	Under/overblow display	X/-

POWER DOWN SAVE PARAMETERS AND INITIAL DEFAULT VALUES (Continued)

Select Code	Select Function	Initial Default Value
C4	Fuse map display format	On
CC	Illegal bit check on/off	Off
CE	List vectors on/off	Off
C0	Echo/no echo	Echo
E1	Terminal mode on/off	Off
E9	Fingerprint starting vector	0
E9	Logic fingerprint	n/a
E8	Number of fingerprint cycles	0 (disabled)

SELECT F E *PWR DOWN SAVE FE*

START *PWR DOWN SAVE ***

REJECT COUNT (PROGRAMMING PULSE) OPTION (E5)

During programming operations, the Model 60 provides either a single pulse for programming the device, or issues the manufacturer's recommended number of programming pulses for a particular device. This function allows selection of either number of programming pulses before the device is rejected as unprogrammable.

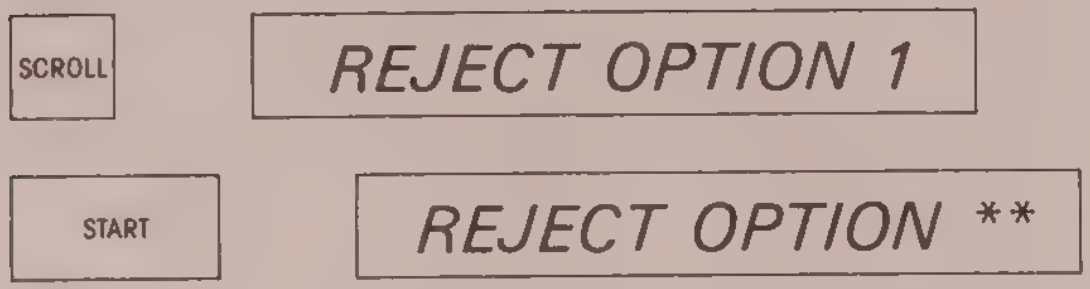
SELECT → E → 5 → *REJECT OPTION E5*

START → *REJECT OPTION 0*

If the manufacturer's number of pulses is desired,

START → *REJECT OPTION ***

otherwise, select single pulse programming



REMOTE CONTROL ON/OFF CODE (FC)

When operating the programmer in a remote control mode, where a remote computer is used to control operation, it may be necessary to "turn-off" the programmer at certain times.

To turn the programmer off and on, the computer can send a specific "on" code or "off" code out to the bus. The programmer recognizes the code as a turn-on or turn-off command and assumes the commanded state. The on and off codes are selected as described in the following key sequence and once established may be used by the control computer to control the operating state of the programmer.

SELECT F C → *REMOTE ON/OFF FC*

START → *RMT ON/OFF∧00 00*

Enter the two-digit (hexadecimal) on code

X X → *RMT ON/OFF XX∧00*

where XX is the desired ASCII on code expressed in hexadecimal format

Enter the two-digit (hexadecimal) off code

Y Y *RMT ON/OFF XX∧ YY*

where YY is the desired ASCII off code expressed in hexadecimal format

START *REMOTE ON/OFF ***

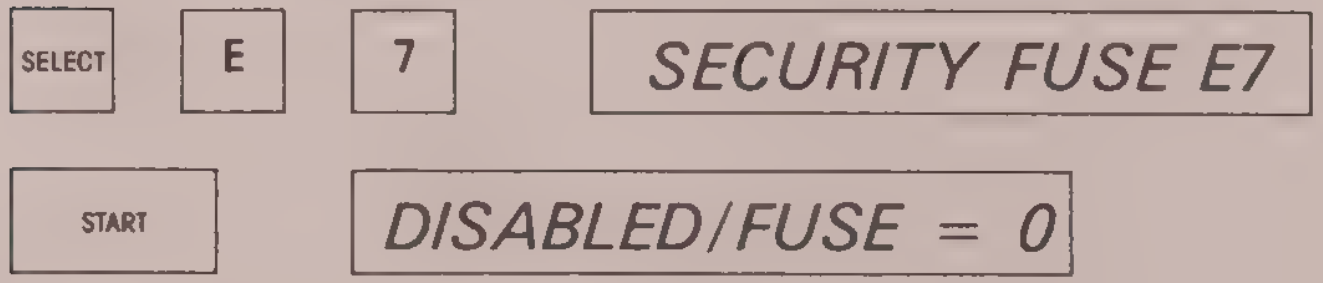
SECURITY FUSE (E7)

You can select from four fuse options:

- Disable programming of the fuse and set the security fuse state in the programmer memory to 0 (unprogrammed).
- Disable programming of the fuse and set the security fuse state in the programmer memory to 1 (programmed).
- Enable programming of the fuse and set the security fuse state in the programmer memory to 0 (unprogrammed).
- Enable programming of the fuse and set the security fuse state in the programmer memory to 1 (programmed).

CAUTION

Once the security fuse is blown, the process cannot be reversed; therefore be certain that you want to program the security fuse before you activate this function. Attempting to reprogram the device after the security fuse has been blown will cause indeterminate results.



If this security fuse option is desired,

otherwise

as necessary to display the desired option, then

SETTING THE FUSE FORMAT (C4)

When the fuse map is sent to the terminal for display by means of the Output Fuse Map function, the individual fuses appear as "X"s and "-"s, or as "0"s and "1"s, depending on whether the "X/-" or "0/1" display format is selected.

This command allows selection between these two display formats. With the "X/-" format selected, an intact fuse (low resistance) appears as a "X", while a blown fuse (high resistance) appears on the display as a "-". With the "0/1" format selected, an intact fuse (low resistance) appears as a "0", while a blown fuse (high resistance) appears on the display as a "1".

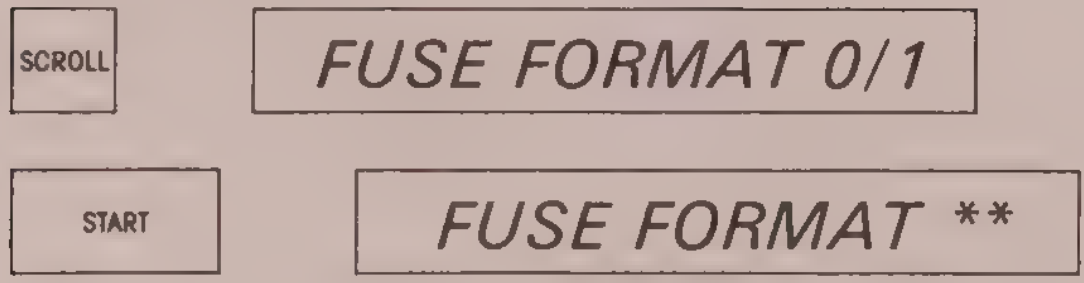
SELECT C 4 → *FUSE FORMAT X/- C4*

START → *FUSE FORMAT X/- C4*

To select the "X/-" format

START → *FUSE FORMAT ***

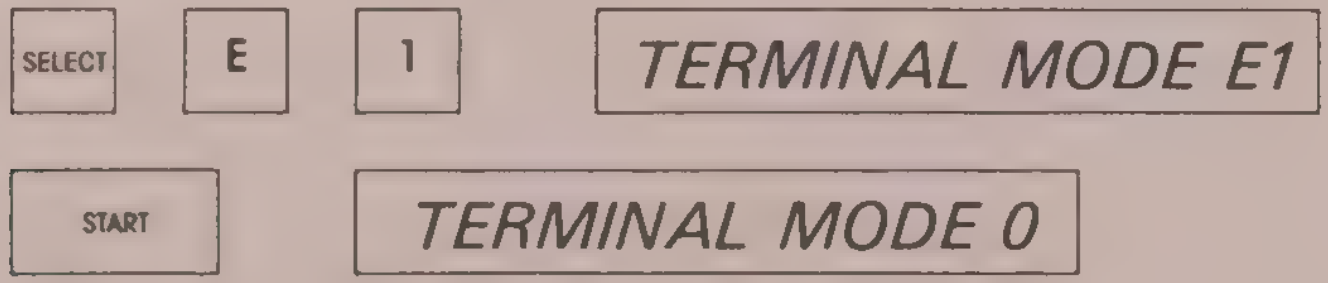
To select the "0/1" format



TERMINAL (REMOTE) MODE (E1)

The Model 60 may be operated by means of the front panel, or by a remote terminal via the rear panel RS- 232C communications port. The terminal must be connected in accordance with RS-232C specifications and the communications protocol set to match the programmer, or vice versa.

NOTE: During operation of the remote terminal, large amounts of received data (more than a screen) will cause scolling of the first-received data off the screen. To halt scrolling (pause transmission by the programmer), enter CTRL-S; to resume scrolling (reception of data from the programmer), enter CTRL-Q.



TEST MODES SELECTION (E6)

After each logic device is programmed, the Model 60 performs a fuse map verification test, a logic fingerprint, a structured vector test, or any combination of these tests. This system command permits selection of the fuse map test with the fingerprint and vector test, of the fuse map test alone, or of the fingerprint and vector test without the fuse map test.

NOTE: In order to perform the logic fingerprint test, the number of fingerprint cycles must be set to greater than 00, since 00 disables the test. To perform the structured vector test, the test vectors must be loaded or entered into the programmer, since the lack of vectors disable the vector test.

If it is desired to perform all tests (fuse map verification, logic fingerprint, and structured vector),

If it is desired to perform only the fuse array verify test,

indicating that the test mode selection is complete.

If it is desired to perform only the vector and logic fingerprint tests (provided they are enabled)

VERIFY PASSES - SELECT THE NUMBER/TYPE OF DEVICE (CA)

During programming operations, the Model 60 can be made to verify the fuse array of the programmed device against the fuse map within the programmer memory. The command described below allows selection between a single-pass verify operation or a two-pass verify operation, before the device is rejected or accepted.

In the single-pass verify operation, the device is checked using a specific value of VCC to verify that the fuses are blown or intact. In the two-pass verify operation, the device is checked first using manufacturer-specified VCC values to verify each fuse.

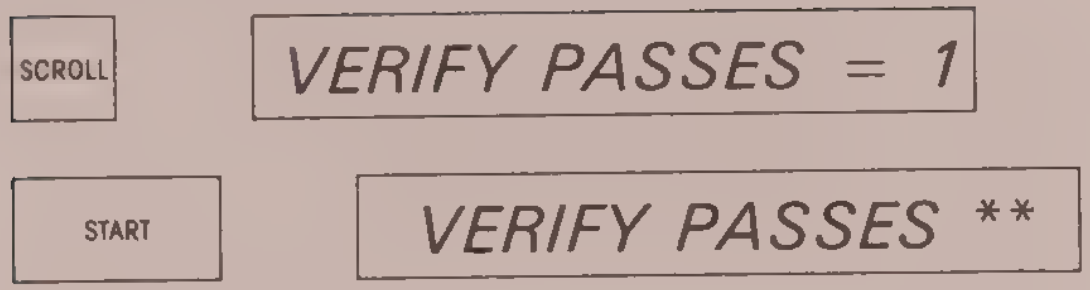
SELECT C A *VERIFY PASSES CA*

START *VERIFY PASSES = 2*

If two passes of the verify operation are desired,

START *VERIFY PASSES ***

otherwise

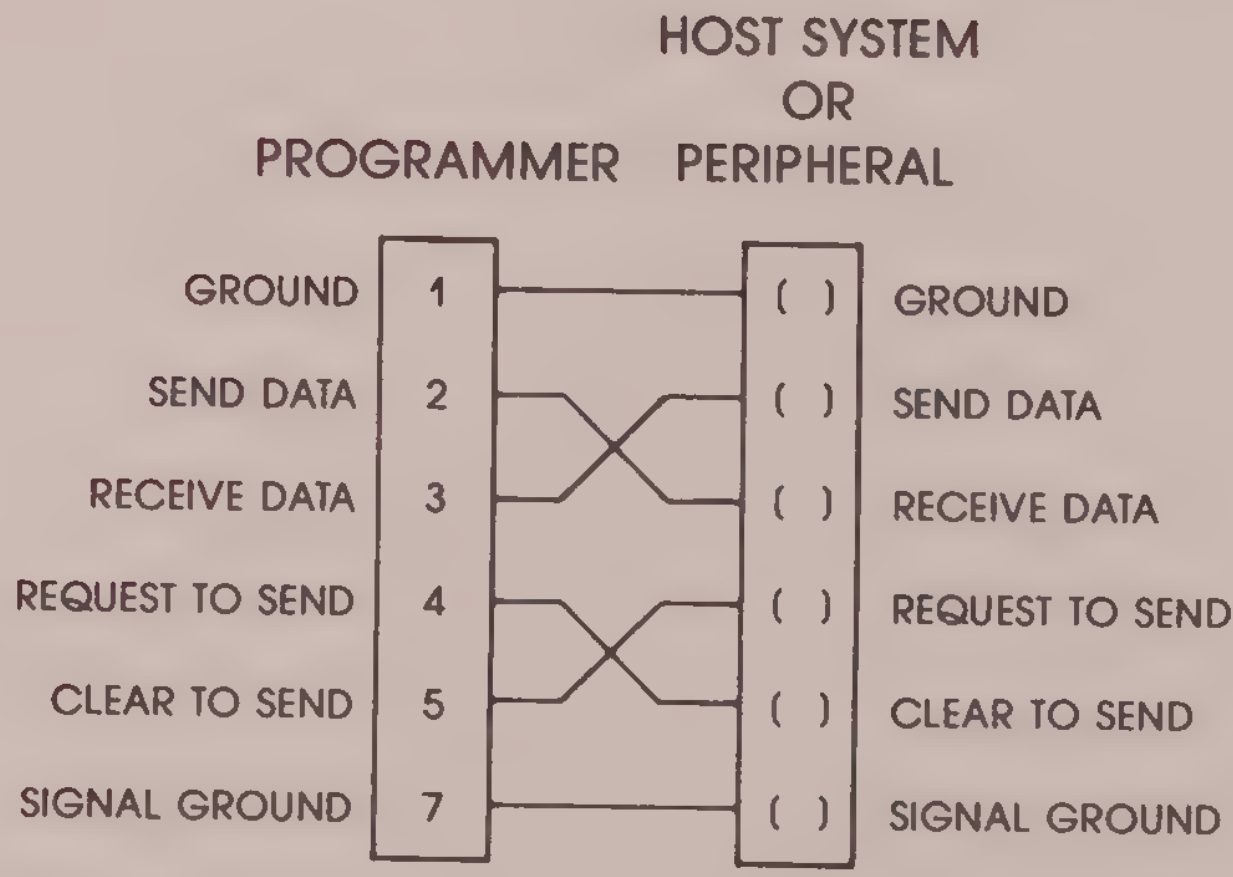


COMMUNICATIONS

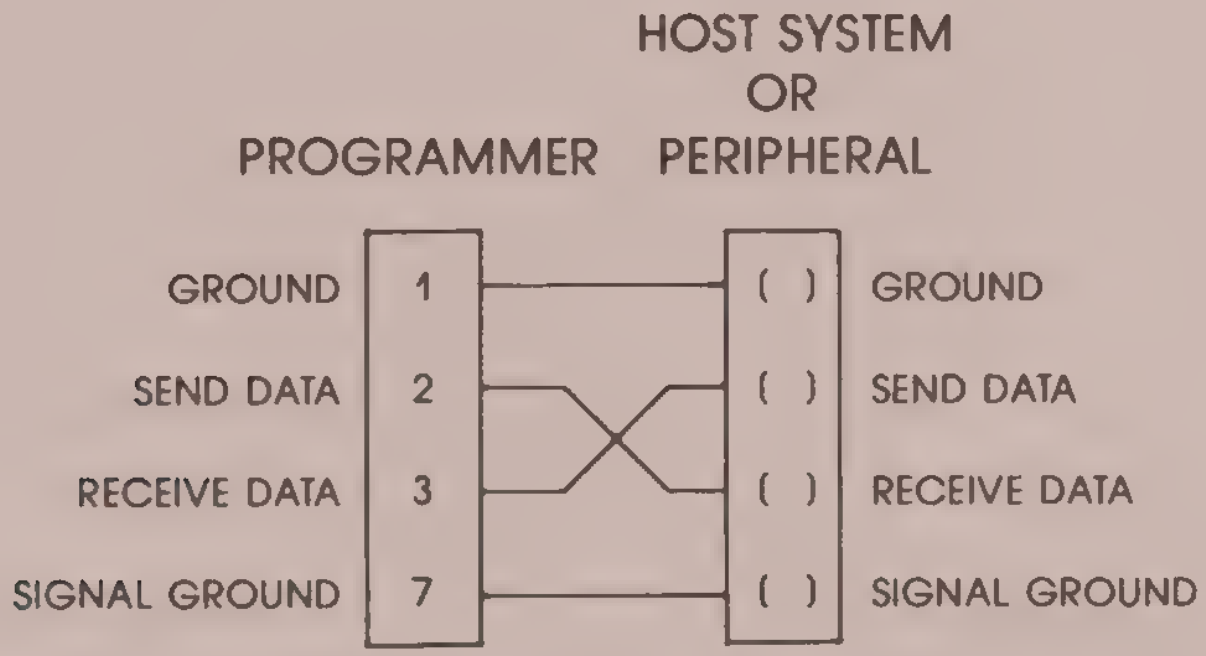
The Model 60 can communicate with a variety of external devices. Communication protocols and JEDEC data format can be set from the front panel. This section explains the setting of the protocols and JEDEC format, and provides procedures for transferring files to and from the Model 60.

SERIAL PORT CONNECTIONS

In order to interface the programmer with a peripheral, you must connect an RS232C cable. The illustration shows a typical interconnection method. In general, a three-wire hookup without handshaking is sufficient. However, if response time is slow, a five-wire hookup with handshaking may be used.



a) RS232C Connection, Half/Full Duplex, with Handshake



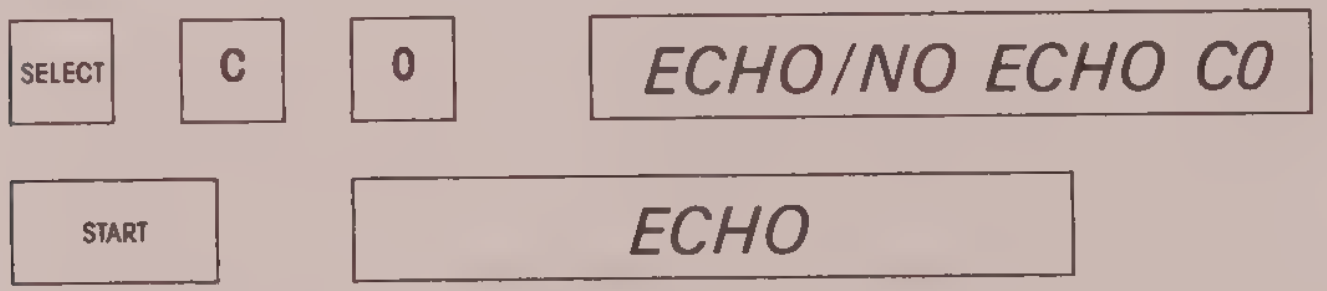
b) RS232C Connection, Half/Full Duplex, without Handshake

NOTES:

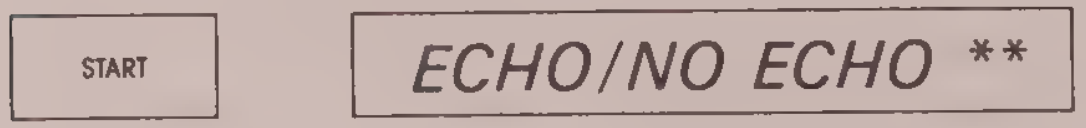
1 All signals are named with respect to the originating unit
2 All undesignated pins are to be left open
3 For applications that do not require handshaking, the programmer's clear to send line is pulled up internally
4 Host system's pin numbers are left blank so that you can fill in the designators for your terminal or computer

Select Echo Mode (C0)

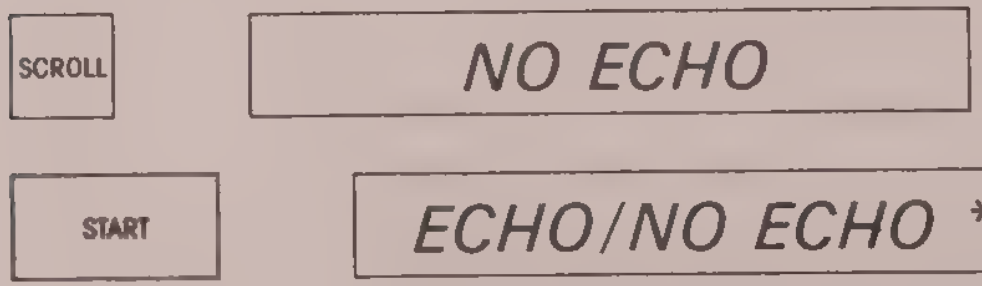
The echo function affects operation of the programmer in the terminal mode. The purpose of the echo mode is to accommodate external equipment that does not feature a selectable half/full duplex mode; i.e., they require the equipment connected to them to send back each data character sent by the terminal.



If the echo function is desired,

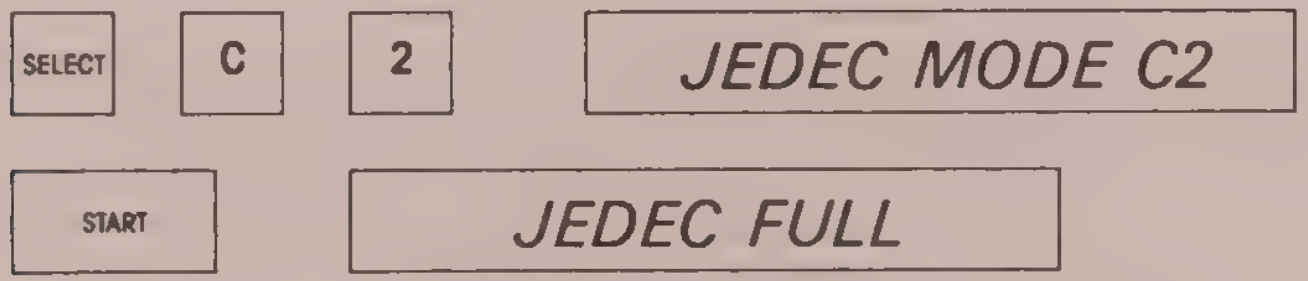


otherwise



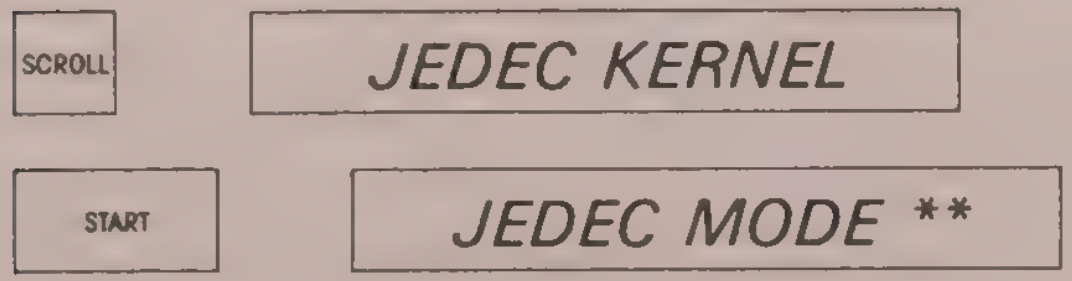
Select JEDEC Data Mode (C2)

For I/O operations where the Model 60 receives JEDEC data from an external source, selection may be made between the "full" mode and the "kernel" mode. In the "full" mode, the programmer receives all JEDEC data downloaded from the data source. However, in the "kernel" mode, the programmer receives and stores only a subset of the JEDEC data file, which consists of the fuse map only.



If the JEDEC kernel function is desired,

otherwise



Select End-Of-Data Code (C6)

When transmitting the programming data to an external computer, an end-of-data code may be required to denote the end of the fuse map. The end-of-data code may be a CTL-Z or and ETX character, and signifies the end of the fuse map data when the output fuse map function (EA) is executed.

SELECT C 6 *END DATA CODE C6*

START *END CODE CTL-Z*

If CTL-Z is desired for the end-of-data code,

START *END DATA CODE ***

otherwise

SCROLL *END CODE ETX*

START *END DATA CODE ***

Select Baud Rate (DA)

For communications setup, the baud rate (data speed) must be set to match that of the remote equipment.

SELECT → D → A → *BAUD RATE DA*

START → *BAUD 9600 DA*

If 9600 is desired for the data speed over the communications port,

START → *BAUD RATE ***

otherwise

SCROLL

as necessary to obtain the required baud rate on the programmer display. When the display shows the required baud rate,

START → *BAUD RATE ***

Select Parity (DB)

For communications setup, the parity must be set to match that of the remote equipment.

SELECT → D → B → *PARITY MODE DB*

START → *PARITY NONE DB*

If no parity is required for the data communications,

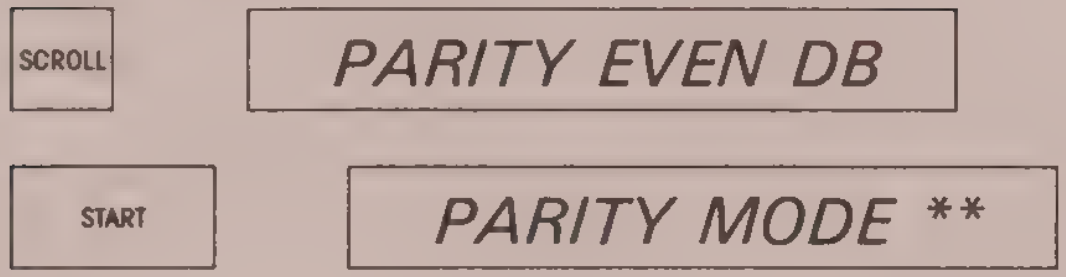
START → *PARITY MODE ***

otherwise, to select odd parity

SCROLL → *PARITY ODD DB*

START → *PARITY MODE ***

otherwise, to selected event parity



Select Stop Bits (DC)

For communications setup, the number of stop bits must be set to match that of the remote equipment.

SELECT D C *STOP BITS DC*

START *STOP BITS ONE DC*

If one stop bit is required for the data communications,

START *STOP BITS ***

otherwise

SCROLL *STOP BITS TWO DC*

START *STOP BITS ***

TRANSFERRING DATA TO THE MODEL 60

Data can be transferred to the Model 60 through the serial RS-232C port located on the rear panel of the programmer.

NOTE: Before loading the program data from the external data source to the programmer, it is necessary to select the proper communications protocol on the programmer.

1. With the external data source setup as necessary, download the programming data to the Model 60.

2. When loading is complete, the display reads

where XXXX is the checksum of the loaded fuse map.

TRANSMITTING FUSE MAP TO EXTERNAL EQUIPMENT

The transmitting of the fuse map to an external piece of equipment consists of loading the fuse map from the programmed device to the programmer, then sending the data from the programmer to the external equipment via the serial I/O port.

NOTE: Before sending the fuse map to the external equipment, it is necessary to select the proper communications protocol on the programmer.

1. Perform the load operation with the device containing the map to be transmitted installed in the appropriate socket, and with reference to Loading the Data from a Master Device contained in the Programming section.
2. Transmit the fuse map from the programmer's memory.

3. When transmission is complete, the display reads

*OUTPUT DONE***

COMPUTER REMOTE CONTROL COMMANDS

Title	Command	Response
Carriage return	CR	None
Escape or break	ESC	>CRLF
	BREAK	>CRLF
Software version	G	HHHH>CRLF
Display sumcheck	S	HHHH>CRLF
Error code inquiry	X	HH..HH>CRLF
No operation	H	>none
Terminal remote mode	Z	none
Clear all RAM	↑	>CRLF
Illegal bit check	T	>CRLF
Non-blank check	B	>CRLF
Family/pinout code	[	FFPP>CRLF
Set device family/ pinout codes	FFPP	>CRLF
Load fuse map	L	>CRLF
Program device	P	>CRLF
Test device	V	>CRLF
Inquire device characteristics	R	FFFF/B/V>CRLF
Set nulls	HHU	>CRLF
Input data	I	>CRLF
Select odd parity	D	>CRLF
Select even parity	E	>CRLF

COMPUTER REMOTE CONTROL COMMANDS (Continued)

Title	Command	Response
Select no parity	N	>CRLF
Select one stop bit	J	>CRLF
Select two stop bits	K	>CRLF
Output data	O	>CRLF

Title	Command	Response
Security fuse 0CR = disable fuse, set state to 0 1CR = disable fuse, set state to 1 2CR = enable fuse, set state to 0 3CR = enable fuse, set state to 1	E7] CR	>CRLF
Reject option 0CR = select reject option 0 (mfr's recommended pulses) 1CR = select reject option 1 (single program pulse)	E5] CR	>CRLF
List vectors 0CR = list vectors function off 1CR = list vectors function on	CE] CR	>CRLF
Verify passes 0CR = two pass, high/ VCC low levels 1CR = single pass, nominal VCC level	CA] CR	>CRLF
Starting vector SSSSSSSSCR where SSSSSSSS is the starting vector expressed in hexadecimal notation then, EEEEEEEECR where EEEEEEEE is the expected logic fingerprint expressed in hexadecimal notation	E9] CR	>CRLF

SYSTEM COMMANDS (Continued)

Title	Command	Response
Test modes 0CR = all tests 1CR = fuse array verify only 2CR = structured vector and logic	E6] CR	>CRLF
Output fuse map	EA] CR	fuse map/ end code/ >CRLF
Fill fuse map 0CR = fill fuse map with 0's 1CR = fill fuse map with 1's	A2] CR	>CRLF
Over/under blow 0CR = disable function 1CR = flag over/underblown fuses	C8] CR	>CRLF
Set fuse format 0CR = display fuses in "X/-" format 1CR = display fuses in "0/1" format	C4] CR	>CRLF
Save system defaults	FE] CR	>CRLF

Title	Command	Response
Fingerprint cycles where XX is the decimal number of cycles to be performed, up to a maximum of 99. To disable this function, enter a zero of XX.	E8] XXCR	>CRLF
JEDEC mode 0CR = JEDEC full mode 1CR = JEDEC kernel mode	C2] CR	>CRLF

NOTE: When issuing any of the above system commands, the computer must output a "CR" return after the "]" character but before the required command data. The computer must also send a "CR" following the command data to terminate the command sequence. The programmer responds with ">CRLF" after the computer sends a "CR" following the command data.

INDEX

A
abort a function, 4

B
baud rate, 71
bit test, 41
blank device check, 44

C
clear memory, 30
commands
  remote control, 77, 79
  system, 27
  table of, 28
communications
  baud rate, 71
  connection, 65
  data transfer, 75, 76
  echo mode, 68
  parity, 72
  protocol, 68, 71, 72, 74
  stop bits, 74
configuration
  display, 33
corrections
  keyboard entry, 4

D
data transfer, 75
device part numbers, 7, 8
device programming, 13, 19
device selection, 8
display configuration, 33
display fingerprint, 40
display fuse format, 58
display prompt, 4
display sumcheck, 32
display under/overblown fuses, 47

E
echo mode, 68
edit, 34
edit fuse map, 34
end-of-data code, 70
examine fingerprint, 18

F
failed vectors, 42
family code, 7, 10
fingerprint
  display, 40
  examine, 18
fingerprint cycles, 37
  number of, 37
fingerprint cycles
  entry, 37
fuse
  display format, 58
  security, 56
fuse map
  edit, 34
  fill, 36
  load, 36
  transmit, 45, 76

fuse map display, 58
fuse map transfer, 8
fuse map/array test, 13

H
host computer, 31, 77, 79

I
illegal bit check, 13
illegal bit test, 41
INPUT key, 3

J
JEDEC data, 69
JEDEC mode, 69

K
keyboard, 1

L
list failed vectors, 42
load
  fuse map, 36
LOAD key, 3
load operation, 8, 14
logic fingerprint test, 13

M
manufacturer's part
  number, 7, 8
memory
  clear, 30
  set to zero, 30

N
non-blank check, 13, 44

O
on/off code, 54
operation
  abort, 4
  edit, 34
  loading, 14
  programming, 19
  remote, 31
  terminal, 59
  termination, 4
  testing, 23
OUTPUT key, 3

P
parameters
  save, 50
parity, 72
part number
  device, 7, 8
  manufacturer's, 7, 8
pinout code, 7, 10
power down save, 50
PROG key, 3
programmer configura-
  tion, 33
programming, 13, 19
  device, 13
  from master device, 13
programming operation,
  20
programming pulse
  selection, 52
prompt
  display, 4
pulse
  programming, selec-
  tion, 52

R
reject count, 52
remote commands, 77,
  79
remote control, 31, 77,
  79

remote on/off code, 54
remote operation, 59, 70
REVIEW key, 3
RS-232C
  data transfer, 75
  fuse map transmission, 76
RS-232C connection, 65

S
save parameters, 50
SCROLL key, 3
security fuse, 56
select code
  definition, 5
SELECT key, 3
single pass verify, 62
START key, 3
starting vector, 38
stop bits, 74
structured vector
  test, 13
sumcheck, 32
  display, 32
system commands, 27
  table of, 28

T
terminal operation, 59
test
  blank device, 44
  fingerprint, 61
  fuse, 61, 62
  illegal bit, 41
  non-blank, 44
  selection, 60
  vector, 61
  verify fuse, 62
TEST key, 3
test modes, 60
testing
  selection, 60
testing operation, 23
transmit fuse map, 45
two-pass verify, 62

U
under/overblow display, 47

V
vector
  fingerprint, 38
  listing of failed, 42
  starting, 38
vectors
  failed, 42

MP MASTER
MA32178

DATA I/O

Data I/O 10525 Willows Road N.E., P.O. Box 97046 Redmond, Washington 98073-9746